National Institute of Environmental Health Sciences

Stronger associations between daily mortality and fine particulate air pollution in summer than in winter: Evidence from a heavily polluted region in western Europe

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Abstract:

Background: Numerous studies have shown a strong association between daily mortality and small particulate with a diameter of <10 μm (PM 10) air pollution, but the effects of season have not always been well characterised. Aim: To study the shape of the association between short-term mortality and PM10 across seasons and quintiles of outdoor temperature. Design, setting and participants: Daily data on mortality (n Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 354 357), outdoor temperature and PM10 in Flanders, Belgium, from January 1997 to December 2003, were analysed across warm versus cold periods of the year (April-September v October-March), with seasons and quantiles of outdoor temperature as possible effect modifiers. Results: There was a significant ($p<0.001$) interaction between PM10 and period of the year in relation to mortality. To allow for non-linearity, daily mean PM 10 concentrations were categorised into quartiles. Season-specific PM10 quartiles showed a strong and steep linear association between mortality and PM10 in summer and a less linear association in spring and autumn, whereas in winter the association was less strong and mortality was only increased in the highest PM10 quartile. The effect sizes expressed as the percentage increase in mortality on days in the highest season-specific PM10 quartile versus the lowest season-specific PM10 quartile were 7.8% (95% CI 6.1 to 9.6) in summer, 6.3% (4.7 to 7.8) in spring, 2.2% (0.58 to 3.8) in autumn and 1.4% (0.06 to 2.9) in winter. An analysis by quintiles of temperature confirmed these effect sizes. Conclusion: The short-term effect of particulate air pollution on mortality strongly depends on outdoor temperature, even in a temperate climate.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution

Air Pollution: Interaction with Temperature, Particulate Matter

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Belgium

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified